Teacher Preparation
Preservice and Inservice Recommendations

Teacher Preparation Workgroup

VIRGINIA EDUCATIONAL TECHNOLOGY ADVISORY COMMITTEE

May 1997

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There is increasing interest nationally in the preparation of teachers to employ technology in their teaching. At the second national education summit held in March 1996, the nation's governors and CEOs, led by Louis Gerstner of IBM, emphasized the important role technology will play in helping to bring about school reform and higher student achievement. Similarly the President and the Congress have initiated new federal legislation and appropriations to provide technology, infrastructure, and training to support use of educational technologies in schools. In 1995, the National Council for Accreditation of Teacher Education (NCATE) adopted technology requirements. NCATE standard I.C.1 (Content Studies for Initial Teacher Preparation) requires that candidates "develop an understanding of the uses of technology for the subjects they plan to teach" (Cooper and Bull, in press).

In Virginia, proposed Technology Standards for Instructional Personnel place an increasing emphasis on the ability of teachers to appropriately integrate educational technologies into the content areas they teach. These standards will have limited impact unless the preparation and training teachers receive is appropriate. In 1996 the White House Office of Science and Technology Policy sponsored a study by the Rand Corporation that found that few teachers now entering the teaching profession are prepared to deal effectively with technology. The report concludes,

> If the nation fails to aggressively address this problem, the significant investments in technology itself are likely to have marginal impacts on the overall conduct of schooling. (Rand Report developed for the White House Office of Science and Technology Policy, 1996)

A report by the Congressional Office of Technology Assessment notes,

> The kind of training, not just availability is important. Much of today's **t@** educational technology training tends to focus on the mechanics of operating new machinery, with little about integrating technology into specific subjects. (OTA, 1995, p. 25)

In a recent review of technology in schools, Hawkins (1996) notes that until now use of technology in most schools has been marked by an emphasis on computer skills rather than discipline-based learning. She suggests that a transition from isolated skills practice to integration of technologies throughout disciplines is needed.

In-Service Recommendations

The following findings and recommendations are framed in the context of current research on technology and teaching.

1. The content of educational technology courses should be relevant to the discipline taught by the teacher.

Improved instruction is the ultimate and most important reason for the provision of educational technologies. National studies have consistently found that technology training often does not prepare educators to teach their subject areas more effectively. Many of the activities undertaken in the guise of preparing teachers to use technology have been inadequate. According to the Congressional Office of Technology Assessment (OTA):

> Much of today's educational technology training tends to focus on the mechanics of operating new machinery, with little about integrating technology into specific subjects. (OTA, 1995, p. 25)

Many teachers have a working knowledge of content-free tools software but are often unfamiliar with the range of content-specific software in their disciplines.

2. A systemic approach is desirable.

Research suggests that efforts to integrate technology into education are most efficiently addressed though a systemic approach. An individual approach defines the problem as a matter of educating individual teachers. A systemic approach defines the problem from the perspective of the educational system as a whole.

a. Peer Support

In a national, longitudinal study, Becker (1 994) reported that the presence of computer-using peers was the factor most strongly associated with the presence of exemplary computer-using teachers. This suggests that teachers should not be randomly selected for technology training, but should be identified from a systemic perspective at the school division level.

b. Division Support

Provision of training to teachers who do not have access to these technologies in their classrooms may be frustrating and counter-productive. Teachers should have an assurance that resources comparable to the ones addressed in training will be available for subsequent use in their classroom or school. Since school divisions are the entities in the best position to provide such assurances, they should be involved in program pluming and teacher selection.

3. On-going support is essential.

> One of the most important studies on integration of computers into classroom practice to date was conducted by Sheingold and Hadley (1990). They conducted a national survey of teachers who are accomplished in the use of classroom technology, and found that teachers on average require five to six years of experience to master computer-based teaching practices.
>
> This suggests that the presence of on-going follow-up support after the workshop is crucial. A study by the Congressional Office of Technology Assessment (1995)
> reported:
>
> There is abundant evidence that 'one-shot' or short duration training programs have little impact. Teachers need time to learn, plan, try things out, reflect on their successes and failures, revise, and try again. That takes time - months, if not years. (OTA, 1995, p. 159)

A **Sample In-Service Initiative**
Technology Across the Curriculum

A number of initiatives have been under-taken with the intent of addressing the newly developed "Technology Standards for Instructional Personnel." The Technology Across the Curriculum (TAC) project is one of a number of such initiatives currently under development. It is presented as an illustration of one way in which the standards might be addressed through in-service activities that can be adjusted to meet the needs of each individual school division.

The purpose of the Technology across the Curriculum project is to develop a model course that will encourage integration of technology into specific content areas. Conventional educational technology in-service courses for teachers suffer from two limitations:

1. The individual preparing the course has a limited amount of time to devote to development of each session.
2. Very few individuals are equally expert in all content areas.

Several sessions at the beginning of the course will introduce teachers to basic educational technology tools such as word processing, spreadsheets, telecommunications, hypermedia, and graphics tools. At the elementary (K-5) level, these will be followed by sessions in each of four content areas.

> survey of teaching tools (5 sessions)
> science (2 sessions)
> mathematics (2 sessions)
> English (2 sessions)
> history & social science (2 sessions) summary / project presentations (I session)

Teachers at the secondary level will focus primarily on their specific content area. (That is, a geometry teacher will devote the majority of session to use of technologies in

mathematics, for example.)

A pre-course session (designated as "Session 0") will be available to course participants who require an introduction to operating systems. This will be followed by a survey of basic tool software in the next five sessions. The survey of instructional tools will provide a foundation that can be used in each of the next eight sessions in specific content areas. The outline developed is intended as a starting point or guideline for each school division. However, it is anticipated that individual school divisions will adapt the materials to their individual requirements.

Under ideal circumstances, the in-service workshop will be conducted during the academic year to allow teachers to try out new skills with students in their own classrooms between sessions. This will also ensure that the teachers have an opportunity to employ the specific hardware and software in their respective schools. Additional information is available at: **http://teach.virginia.edu/go/tac.**

Pre-Service Recommendations

In 1994 the Virginia Department of Education *Educational Technology Task Force* reported,

> "In the past there has been a significant mismatch between a well-defined planning process for infusion of educational technologies into Virginia's schools at the K-12 level, and planning and support of pre-service teacher education programs. ...

When teacher education students enter the teaching force, it contributes to and compounds an already serious in-service training problem." Virginia Department of Education Research Consortium, *Educational Technology Task Force Recommendations, 1994*.

The 1996 task force that developed the *Technology Standards for Instructional Personnel* also explicitly noted that it will be essential to include pre-service teacher education programs in any state-funded technology initiatives (see Appendix).

This 1994 VDOE Educational Technology Task Force findings were endorsed by the Superintendent of Public Instruction and ten deans of education. The task force recommended closer coordination between SCHEV and the Virginia Department of Education and inclusion of pre-service teacher education programs in all future educational technology plans and initiatives.

Many schools assume that recent teacher education graduates will be familiar with the latest educational technologies. Often that is not the case. The Congressional Office of Technology Assessment found that,

> ... overall, teacher education programs do not prepare graduates to use technology as a teaching tool. (OTA, 1995, p. 184

While half of the recent graduates of teacher education programs surveyed reported that they had been given preparation in use of drill-and-practice and tutorial software, fewer than one in IO felt prepared to use formats such as multimedia packages, electronic

presentations, collaborations over networks, or problem solving software (OTA, 1995, p. 185) This failure presents a substantial in-service teacher preparation burden that contributes to ineffective use of technology in schools.

One member of the Virginia Department of Education 1994 *Educational Technology Task Force* on pre-service education observed,

> The fact that pre-service teachers in Virginia often do not have an opportunity to experience use of technology or to see their professors in education using technology is a critical factor in the molding and formulating of attitudes, methods of solving instructional problems, and generally the performance of that future teacher. To say there is a cost to conduct in-service workshops after that teacher graduates from a teacher education program is understating the case.
>
> There is not much one can do to balance one teacher who has not used technology nor seen it used against someone who has used technology, seen technology used by professors, and actually solved problems and constructed curriculum and activities with technology as a central focus. You certainly cannot balance this use against one in-service course. It is parallel to graduation of a physician who has never seen an X-ray, saying, 'We will remediate basic deficiencies after graduation through in-service programs.' (Ray Racquets, James Madison University, posting to Ed_Res mailing list, March, 1993)

The 1994 Educational Technology Task Force issued a set of recommendations regarding the need for comprehensive coordination at all 37 of Virginia's teacher education programs. These recommendations were endorsed by the deans of the ten teacher education programs represented on the task force, by the SCHEV representative, and by the Superintendent of Public Instruction. To date the recommendations have not been implemented.

Many colleges of education simply do not have up-to-date equipment, and universities may assign higher priority to provision of computing equipment to other areas such as engineering. However, the problem is broader than lack of equipment, although that is an important element. The limitations include:

1. Lack of Access to Technology

   Many schools and colleges of education do not have access to the full range of technologies which will be available to their students when they enter the public schools as teachers.

2. Lack of Laboratory Space

   Space can be even more of a constraining, factor than equipment. The majority of the current education buildings were constructed prior to the widespread distribution of microcomputers in the public schools in the 1980s. Establishment of a microcomputing facility which will allow classes of reasonable size to be offered (30 to 40 students per section) may mean conversion of an existing classroom, or costly installation of additional electrical service, environmental control, and networking facilities.

3. Lack of Laboratory Staffing and Support

This is a problem, which varies widely among schools of education. At some institutions, it is not possible to leave laboratories and computing classrooms unattended - and due to budgetary reductions related to the recession, it may be difficult to provide support for staff or work study students to monitor the laboratories. A faculty member serving on a state task force to study this problem noted,

> "This is an extremely important item, and could not be overemphasized. Our experience with our new lab has shown that infusion of new equipment and software demands a huge commitment of personnel, not just for installation, but primarily for continual maintenance, development and upgrading."

4. Lack of Support for Faculty

There is a clear pattern, which suggests that if university faculty do not have appropriate hardware and software in their offices, they usually do not employ these technologies in their courses. It is important for students to see their instructors model use of instructional technologies in their own courses, but this occurs less frequently than might be desirable.

5. Curriculum Limitations

Limitations in the number of hours of teacher education course work present challenges for all aspects of the curriculum. Ideally, educational technologies should be integrated into all aspects of coursework rather than taught as a separate subject, but this is more difficult in practice than in principle.

House Bill 1848

House Bill 1848 "a BILL to amend and reenact BB 22.1-253. l3:5, 2-'1-9.2:', 23-9.8, and 239.13:1 of the Code of Virginia, relating to training in educational technology" that was adopted during the 1997 legislative session, contained a section related to pre-service teacher education. This section directed that:

> SCHEV will, in consultation with the Virginia Department of Education and the accredited teacher education programs of the Commonwealth's institutions of higher education, develop guidelines to ensure that all students matriculating in teacher-training programs meet the standards embodied in Virginia's Technology Standards for Instructional Personnel and have the requisite skills for the implementation of the Board of Education's Six-Year Educational Technology Plan for Virginia.

During summer 1997 a SCHEV task force will develop guidelines that address this directive.

In the past, both the Virginia Department of Education and the State Council for Higher Education in Virginia have indicated that responsibility for co-ordination of pre-service technology and teacher education efforts lie in other domains - SCHEV because teachers are licensed by the Virginia Department of Education and VDOE because teacher education programs are, strictly speaking, the domain of higher education. As a result, coordination of pre-service standards and efforts have fallen through the cracks, resulting in considerable discrepancies among the various pre-service programs of the Commonwealth. The two entities should agree upon where the locus of responsibility lies so that this can be addressed.

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Appendix

Virginia Technology Standards for Instructional Personnel

In September 1995 the Board of Education requested the Advisory Board on Teacher Education and Licensure (ABTEL) to examine the issue of technology proficiencies as a requirement for licensure of instructional personnel. The following draft recommendations are scheduled to be, adopted in July 1997 after review and public hearings in spring 1997. Following approval of the technology standards for public comment as required in the Administrative Process Act (APA), the technology standards (revised based on public comment) and the implementation process will be submitted to the Board for final review and approval.

Background Information and Summary of Major Elements

The proficiencies were to be based on the revised Standards of Learning, which include technology standards that are incorporated in each core discipline to be mastered by students by the end of the fifth and eighth grades, local school division standards, and national efforts in this area.

A task force was organized to develop a proposal for technology standards and training of instructional personnel for consideration by the Advisory Board on Teacher Education and Licensure. This task force included representatives from the Advisory Board on Teacher Education and Licensure (ABTEL), the *Virginia Education Association* (VEA), the *Association of Teacher Educators in Virginia (ATE-VA), Virginia Association of Colleges for Teacher Education* (VACTE), the *Virginia Educational Technology Advisory Committee* (VETAC), and Department of Education staff members.

The task force quickly realized that serious inequalities exist in the ability of schools to provide instruction to enable students to use technology for effective problem solving and productivity. These inequalities can be traced to two main causes. They are the lack of access to adequate equipment and the lack of training for teachers. These issues must be addressed as technology standards are implemented. The *International Society for Technology in Education* (ISTE) noted that "If technology is to become an integrated component of the educational process of our schools, it must first become an essential part of America's teacher preparation programs." The *International Society for Technology in Education has* established guidelines for teacher preparation. The guidelines were approved by the *National Council for Accreditation of Teacher Education* (NCATE) as standards by which technology education programs for teachers are evaluated. Therefore, the needs of state approved licensure programs for hardware, software, and faculty training should be included in the state-funded Educational Technology Plan.

The task force began its process of developing a proposal for stem standards by reviewing the ISTE national standards relating to teacher competencies. In addition, teacher competencies in technology skills and educational applications, as identified by local education agencies in Virginia and other selected states were reviewed and analyzed. The results of this analysis and review by the task force produced eight standards and sample enablers to be used at the pre- and in-service levels. In addition, the task force made suggestions for determining proficiency of technology standards for

instructional personnel.

Technology Standards And Sample Enablers

The task force identified technology standards and sample enablers for each of the state standards. These standards and the sample enablers must be incorporated in local school divisions' technology plans and approved teacher preparation programs in institutions of higher education. The sample enablers are not an inclusive list of possible applications and should not be used as a checklist of required competencies. As technology changes, the knowledge and skills required for instructional personnel in this area will change; therefore, the standards and the sample enablers are flexible and open to revision as needed. The resources required for hardware, software, training, and on-site support must be provided as well.

Proficiency In Technology Standards

The task force recommended that the assessment of instructional personnel's proficiency in the technology standards will be determined at the school division level. School divisions should immediately incorporate these standards in their division-wide technology plans and develop strategies to implement and assess the standards. The enablers provided are intended to be entry level; therefore, school divisions and teacher education institutions must establish provisions for pre- and in-service instructional personnel who have already acquired higher levels of knowledge and skills to test out of the entry-level requirements.

Procedure

Following the presentation of the standards to the Board of Education, public comment and compliance with the Administrative Process Act (APA) will be required prior to approval. The Advisory Board on Teacher Education and Licensure made the following recommendations at the May 23, 1996, Board of Education meeting regarding the implementation of the technology standards for instructional personnel:

> School divisions and institutions of higher education should be given one full year to incorporate the standards into the division-wide technology plan and into approved programs, respectively. School divisions and institutions of higher education should also develop implementation plans for pre and in-service training for instructional personnel. The verification form for colleges and universities to document individuals' completion of approved programs would also be revised so officials may certify prospective teachers' proficiency in the technology standards.
>
> The Board of Education should consider waivers on a case by-case basis of the 18hour professional studies cap placed on teacher preparation programs for institutions requesting additional instruction in educational technology.

- The Board of Education should require school divisions to ensure that newly hired instructional personnel from out-of-state demonstrate proficiency in the technology standards during the three-year probation period of employment.

- The Board of Education should allow coursework in technology to satisfy the

content requirement for licensure renewal for license holders who do not have a master's degree.

- The Board of Education should support the following timeline for implementing the technology standards:

July 1, 1996-July 1997	Board of Education conducts public hearings on the proposed technology standards;
July 1, 1997	Board of Education approves technology standards as regulations;
July 1997-July 1998	School divisions incorporate technology standards into local technology plans and develop strategies to implement the standards.
	Institutions of higher education incorporate technology standards in their approved program requirements and assess students' demonstrated proficiency of the standards.

Superintendent's Recommendation

That the Board of Education authorize the proposed Technology Standards for the Administrative Process Act (APA).

Technology Standards

> To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know who knowledge is organized, how to find information, and how to use information in such a way that others can learn from, them. They are people prepared for lifelong learning, because they can always find the information needed for any tasks or decision.
>
> - *American Library Association*

The following standards are recommended by the Technology Task Force for instructional personnel:

1. **Operate a computer system and utilize software.**

   Sample enablers- use a variety of computer system input/output devices and peripherals; store, organize, and retrieve software programs and data files on a variety of storage devices; navigate different types of software programs including instructional, productivity, application tools, and courseware; troubleshoot general hardware and software problems.

   Rationale: It is expected that by the year 2000, all classrooms in Virginia schools will have computers for teacher and student use. In the "information age," the need to operate a computer and utilize basic software should be as much a part of the daily routine for instructional personnel as it is for most of the business world.

2. **Apply knowledge of terms associated with educational computing and technology.**

   Sample enablers: apply functional knowledge of basic computer components, e.g., operating, applications, and utility software; permanent and removable storage (main memory, hard drive, and optical or magnetic disc); monitor; scanner and digital camera; matrix, inkjet, and laser printers; apply functional knowledge of various technology tools, e.g., video records and players, optical disc players, computer presentation devices, multimedia computer work station.

   Rationale-Educators need a common vocabulary and a functional understanding of educational technologies.

3. **Apply productivity tools for professional use.**

   Sample enablers: use software tools to assist with classroom and administrative tasks; use software tools to design, customize, or individualize instructional materials; use software to enhance communication with students, parents, and community; use telecommunication software to collaborate and find resource materials.

   Rationale: The use of basic productivity software to aid with student records, correspondence, management, and instructional materials development can be effective and time efficient. Educators should be able to model how technology can

be used to enhance learning and job performance.

4. **Use electronic technologies to access and exchange information.**
   Sample enablers: use local and worldwide telecommunications; use search strategies to retrieve electronic information.

   Rationale-An understanding of how to search for organize, and present information using modem media is becoming a common workplace and learning skill. State and national technology initiatives are moving, toward local area networks for all schools. These networks are connected to state, national, and international networks. Educators must know how to access networks and to exchange and/or receive information for both teaching and professional development.

5. **Identify, locate, evaluate, and use appropriate instructional technology-based resources (hardware and software) to support Standards of Learning and other instructional objectives.**

   Sample enablers: understand types, characteristics, sources, and use of effective instructional software and other technology-based learn resources; use tools of technology including, but not limited to, computers, modems, networks, printers, large-group presentation devices, scanners, digital cameras, camcorders, video cassette recorders, optical disc players, etc.

   Rationale- Educators need to utilize effectively all available resources, both traditional and technology-based, and be able to use these resources to assist students in achieving the Standards of Learning.

6. **Use educational technologies for data collection, information management, problem solving, decision making, communications, and presentations within the curriculum.**

   Sample enablers: incorporate word processing, spreadsheet, or database software in instruction; incorporate telecommunications as a component of instruction; and use a presentation and/or authoring program to present a lesson or develop instructional materials.

   Rationale: Many modem jobs require the skills that are mentioned in this standard. Students will need learning experiences that help them become life-long learners with the ability to function in these areas regardless of their eventual work or educational environment. Therefore, teachers must develop and model skills in the use of technology in order to offer students appropriate learning experiences.

7. **Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings.**

   Sample enablers: utilize technology to facilitate assessment and student centered instruction as determined by the discipline and/or grade level taught; use multimedia, hypermedia, and telecommunications software to support individual and/or small group instruction; as teaching assignments dictate, utilize and /or understand resources available concerning adaptive technology; use technology effectively in various educational settings, e.g., one computer in a classroom, class-size computer lab,

computers in classroom clusters or mini labs, multimedia computer work stations, integrated learning systems (ILS); effectively utilize an automated library media center.

Rationale: Educators strive to be responsive to the individual needs and learning styles of a diverse group of students. Technology-based resources can be used to meet these diverse needs in a variety of classroom and laboratory settings.

8. **Knowledge of ethical and legal issues relating to the use of technology.**

Sample enablers: abide by copyright laws, practice responsible uses of technology.

Rationale: Educators using instructional technology serve as models for students. They must have a basic understanding of the complex issues regarding the legal and ethical uses of technology.